USER MANUAL

CU-DIN IPRT KNX

EC10430527

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1 Description

IP Routers are similar to TP line couplers, except that they use Ethernet for the main line. However, it is also possible to directly integrate KNX end devices via IP, making Ethernet respectively IP (Internet Protocol) a KNX medium in its own right.
The ESYLUX CU-DIN IPRT KNX is a tunnelling and routing device. It can be used as line- or backbone coupler and provides a data connection between the upper KNXnet/IP line (main line or backbone) and the lower TP KNX bus line (sub line). It also provides with the tunnelling protocol a connection point for ETS to enable commissioning and monitoring.
CU-DIN IPRT KNX can also connect two separate installations/systems.

Following highlights are characterizing ESYLUX CU-DIN IPRT KNX Router:

- Support of long messages up to 250 byte. In combination with ESYLUX line coupler CU-DIN LC KNX and ESYLUX USB interface “UIM-KNX 42” long messages are made possible (e.g. energy metering applications).
- It provides the tunnelling protocol, a connection point for ETS to enable commissioning and monitoring (4 parallel connections are possible).
- CU-DIN IPRT KNX can be used for replacing a line coupler or an area coupler. The best advantage of this change is using LAN as a fast medium for exchange of telegrams between the lines and/or areas.
- Sending IAK on own message: sending of immediate acknowledged (IACK) on a frame that is sent by the ESYLUX device itself.
- When the CU-DIN IPRT KNX sends a message and there is nobody to acknowledge this message, the CU-DIN IPRT KNX would repeat the last message up to 3 times. In case there is an IACK, there will be no repetition. The failure mechanism in case of a negative IACK or BUSY is still maintained.
- Switching off the filter table with a button on the device without reconfiguring the device with ETS, necessary for fast diagnostic on site. It can temporarily disable filtering of messages by pressing a button. This eases commissioning and debugging of the system. The temporary access to other lines is possible without download from ETS.
- Automatically switching on filter tables and filtering of device oriented tables after time out. Time out is ETS configurable. No forgetting of reactivating the tables anymore.

- Routing of all physically addressed messages (no filtering of device oriented messages), no matter of own physical address, on press of a button on the device without reconfiguring the device with ETS.
- High internal amount of communication buffers capable smoothing peeks in communication load.
- Detailed possibility for diagnosis by displaying all operational states with 6 duo LEDs. (Bus OK (each line), traffic (each line), errors/faulty communication NACK, BUSY on the bus (each line), state of the filter table ...)
- UPnP available to discover the device in IP network. The ETS can discover the device as communication interface through EIB net/IP Search Request.
- WEB interface: currently providing device settings and an opportunity to switch on to program mode.
- The firmware can be updated through the web interface.
- Wide power supply voltage.
- Modular installation device for 35mm DIN rails.

Note: Please note that commissioning straight at delivery status (default settings) means:

- The IP coupler does block all telegrams because the filter table is not defined,
- The fall-back time after manual operation is 120 min and
- The physical address is 15.15.0.

Note: Use this product only as intended (as described in the user instructions). Do not make any changes or alterations as this will render any warrantees null and void. You should check the device for damage immediately after unpacking it. If there is any damage, you should not install the device under any circumstances.
If you suspect that safe operation of the device cannot be guaranteed, you should turn the device off immediately and make sure that it cannot be operated unintentionally.

2 Safety instructions

- **Work on the 230 V power system must be carried out by authorized personnel only, with due regard to the applicable installation regulations.**
- **Switch off the power supply before installing the system.**
- **The 21–30 V ⎓ KNX bus voltage cannot be used as 24 V ⎓ operating or auxiliary voltage.**
- **Please observe the installation instructions for the SELV protective measure.**

3 Product Funtion

3.1 Communication objects

CU-DIN IPRT KNX has no KNX communication objects.

3.2 CU-DIN IPRT KNX as programming interface

CU-DIN IPRT KNX can be used together with the ETS as a programming interface. The device provides an additional physical address for this purpose which can be used for a tunnelling connection.

3.3 Tunnelling

The presence of the Internet Protocol (IP) has led to the definition of KNXnet/IP. KNXnet/IP provides the means for point-to-point connections -KNXnet/IP Tunnelling- for ETS and/or between a supervisory system and a KNX installation. KNXnet/IP Device Management provides configuration of KNXnet/IP devices through the KNX network effectively reducing the time required for configuration.

3.4 Routing

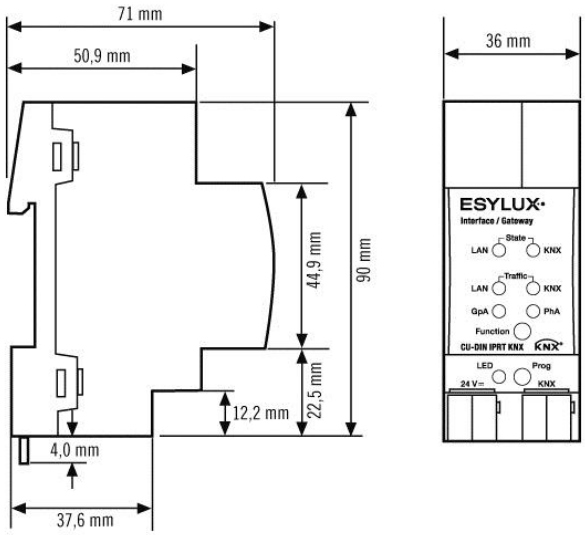
Routing is how lines or areas may interconnect using IP networks via KNXnet/IP. KNXnet/IP Routing defines how KNXnet/IP routers communicate with each other using IP networks.

3.5 Coupler

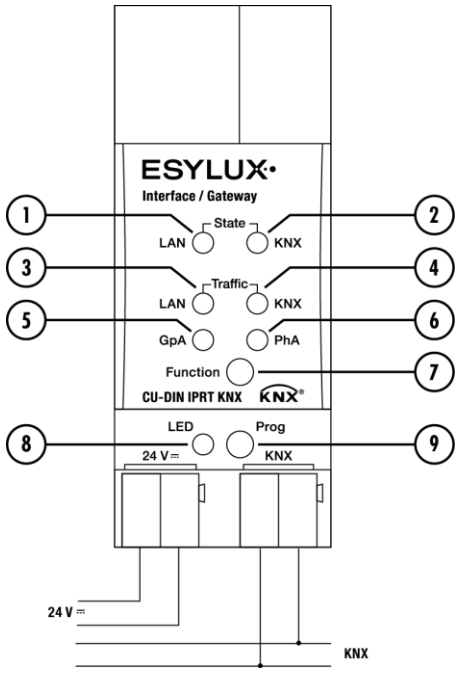
The basic functionality of CU-DIN IPRT KNX is coupling the Ethernet with KNX-TP line(s).
CU-DIN IPRT KNX provides galvanic isolation between the two connected lines. Due to the flexibility of CU-DIN IPRT KNX, the coupler can be used as a line coupler e.g. to connect trough Ethernet several TP lines together, as a backbone coupler to connect trough Ethernet several TP areas or to connect different TP installations/systems.

The main task of CU-DIN IPRT KNX is filtering the traffic according the installation place in the hierarchy or according to the built-in filter tables for group oriented communication.
The CU-DIN IPRT KNX provides outstanding features compared to other similar products, for example support for long messages (up to 250 byte length) and a configurable one button activation of special functions (e.g. transmit all group telegrams). These are helpful during installation, during run time and for trouble shooting. The high informative 6 duo LED display shows accurate the bus status on each line. This helps identifying common communication problems due to bus load or retransmissions on both lines.

3.6 Dimension drawings



3.7 Function description



1. LED Bus Stat LAN
2. LED Bus Stat KNX
3. LED Traffic LAN
4. LED Traffic KNX
5. Routing of group telegrams*
6. Routing of physical addressed telegrams*
7. Function button
8. Programming LED
9. Programming button

*LEDs are not used for “IP-Interface”.

3.8 Normal mode

	Green	Red
LED **1** **Bus Stat LAN**	Off: LAN line error On: LAN line OK	On: manual overwrite active
LED **2** **Bus Stat KNX**	Off: KNX line error or not connected On: KNX line OK	
LED **3** **Traffic LAN**	Blinking: bus traffic on LAN line Off: no traffic on LAN line Speed up to 10 Mbit/s	Blinking: transmission error on LAN line
LED **4** **Traffic KNX**	Blinking: bus traffic on KNX line Off: no traffic on KNX line	Blinking: transmission error on KNX line
LED **5** **Group Address**	Routing of group telegrams • Off: LAN and KNX different • Filter table active	Block
	Green and red: route all	
LED **6** **Physical Address**	Routing of physical addressed telegrams • Off: LAN and KNX different • Filter table active	**Yellow**: block
	Green and yellow: route all	

3.9 Function button

- **Long press (3 sec)**
  Switch to manual override.
  Default function is set with LAN line and (KNX) line parameter.
  Manual override functionality is configured in “General parameters”.

Note: The latest downloaded settings (parameters) and filter table are still available after switching back from “Manual operation” to “Normal operation”.

- **Very long press (15s)**
  LEDs: LEDs are on red
  release button and press again for some sec: resets all the parameter to factory default (incl. physical address).

3.10 Addressing mode

- **LED addressing mode**
  Off: normal operating mode
  On: addressing mode
  After receiving the physical address the CU-DIN IPRT KNX automatically returns from addressing mode to the normal operating mode.

- **Button addressing mode**
  Button for switching between normal operating mode and addressing mode for assigning the physical address.

3.11 Operation modes

CU-DIN IPRT KNX Router can only support one mode at one time, either Link layer mode or bus monitoring mode.
The IP-Router uses in its normal operation as router the Link layer mode. That way it cannot switch to the bus monitoring mode otherwise the routing functionality is no longer possible.

3.12 Boot mode

To enter the boot mode:
- Disconnect the DC power supply,
- Keep both "function button" and "programming button" pressed and connect the DC power supply.

The device enters in “boot mode” in the next situations:
- If after a communication error in the LAN line (traffic LAN LED lighting in red) you try to reset the application (pressing the “manual function” button for 15 seconds).

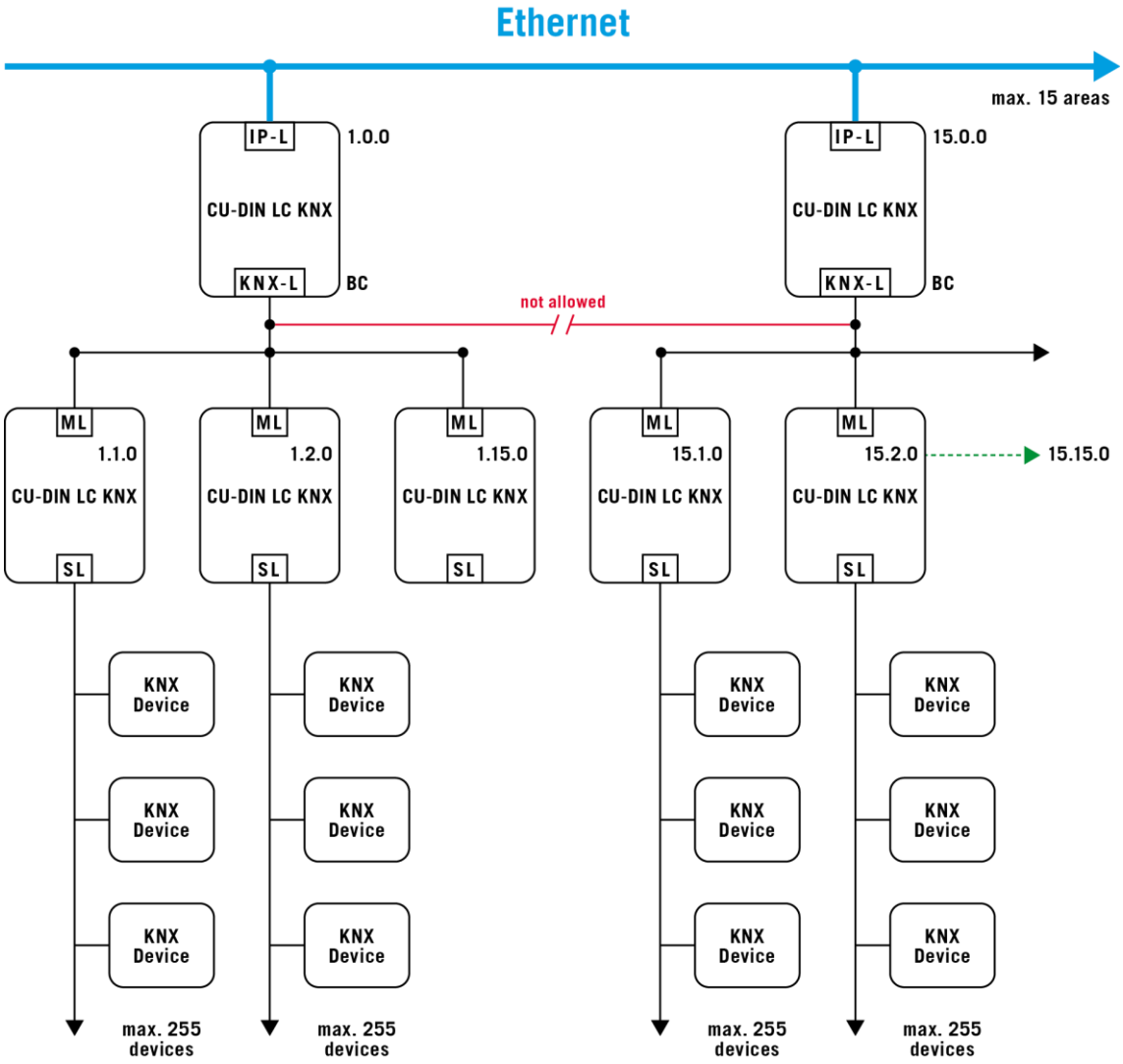
- If you try to reset the application (pressing the “manual function” button for 15 seconds) having the Ethernet cable disconnected.
  To remove the “boot mode” it is necessary to enter in the web interface and update the firmware or reset the application after pressing the “Abort” button.

3.13 KNX Telegrams in the network

The IP Router sends telegrams from/to the KNX to/from the IP network in accordance with the KNXnet/IP protocol specification. These telegrams are sent in the default setting as multicast telegrams to the multicast IP address 224.0.23.12 port 3671. The Multicast IP address 224.0.23.12 is the defined address for the KNXnet/IP from the KNX Association in conjunction with the IANA. This address should stay as defined and only changed if it becomes necessary due to the existing network. By commissioning, it should be regarded that all KNX IP devices which should communicate with one another via IP must use the same IP routing multicast address.Settings are to be changed in the “General Parameters”.
Note: Multicast IP address 224.0.23.12 may need to be enabled corresponding to the type of network and the setting of the network components.

3.14 CU-DIN IPRT KNX as Area coupler

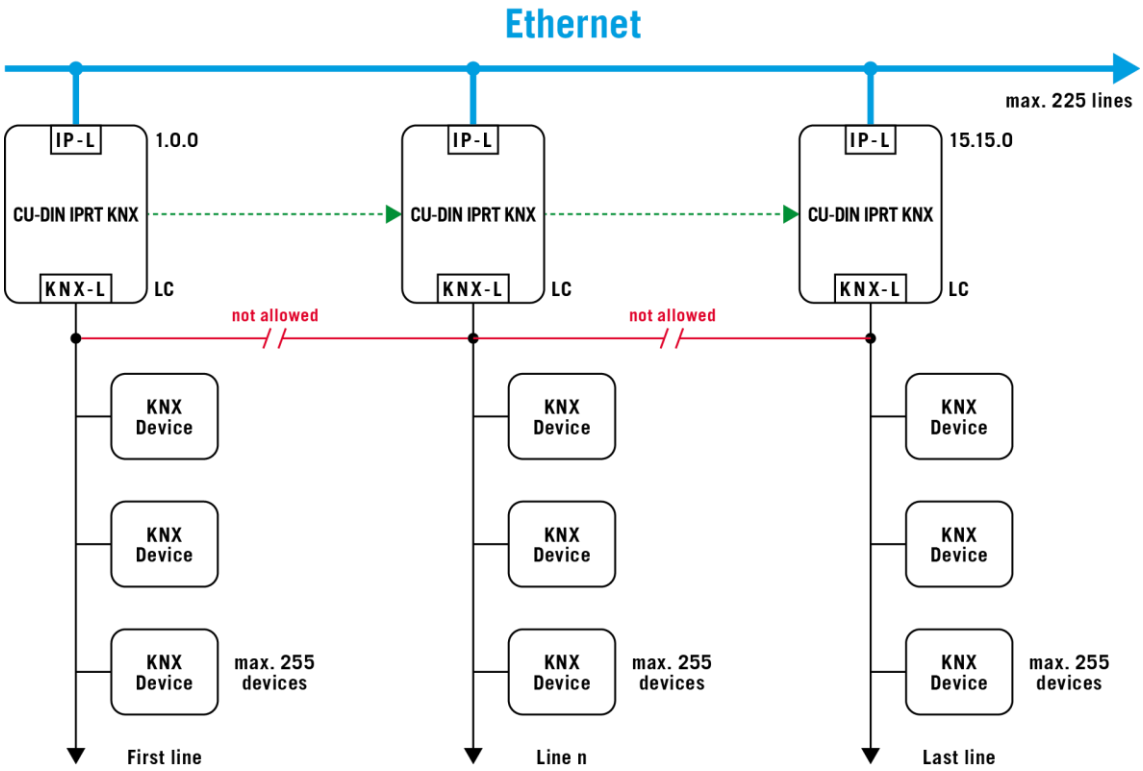
CU-DIN IPRT KNX in a KNX system can assume the function of an area coupler. For this purpose it must receive the physical address of an area coupler (1.0.0 till 15.0.0).
For now in the actual ETS, up to 15 areas can be defined with area couplers.
The following illustration shows the topology with CU-DIN IPRT KNX routers as area couplers and CU-DIN LC KNX couplers as line couplers.



IP-L: IP time
KNX-L: KNX line
BC: Backbone-coupler
ML: Main line
SL: Sub line

3.14 CU-DIN IPRT KNX as line coupler

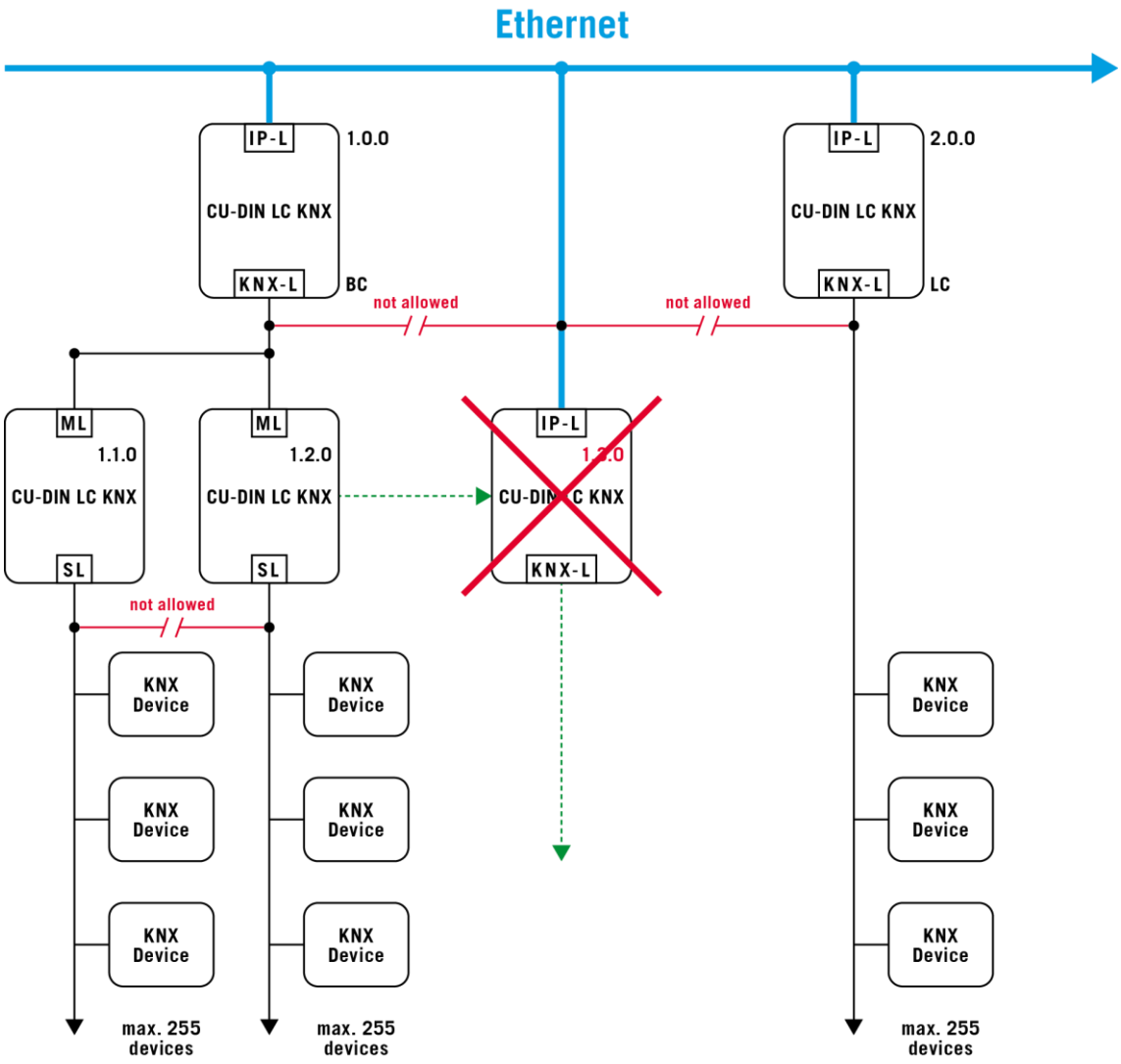
CU-DIN IPRT KNX in a KNX system can assume the function of a line coupler. For this purpose it must receive the physical address of a line coupler (1.1.0 till 15.15.0).
For now in the actual ETS, up to 225 lines can be defined (1.1.0 till 15.15.0).
The following illustration shows the topology with CU-DIN IPRT KNX routers as line couplers.



IP-L: IP line
KNX-L: KNX line
IPRT: Line coupler

3.15 CU-DIN IPRT KNX in mixed System

If it is necessary in a KNX system to use the CU-DIN IPRT KNX at one point as an **area coupler**, e.g. office complex, and at another point as a **line coupler**, e.g. a remote underground garage; this is possible.
It is only necessary to ensure that the CU-DIN IPRT KNX used as a line coupler uses a line coupler address from a free area.



IP-L: IP line
KNX-L: KNX line
BC: Backbone coupler
IPRT: Line coupler
ML: Main line
SL: Sub line

Note: If a KNX/USB or KNX/IP interface is used to program a device in another line connected to a KNX IP Router, you should pay close attention to have a correct topology!

4 Technical Data

Supply voltage	24V ⎓ (12 - 30V⎓) or 12 - 24V~		
Current consumption from KNX	Typ. 5 mA		
Current consumption	Typ. 190 mA		
Power consumption	Typ. 520mW, max 800mW		
Rated voltage / Rated current	Supply (V) 11 15 20 24 31	I typ. (mA) 45 33 25,3 21,6 18	P typ. (W) 0,495 0,495 0,506 0,5184 0,558
Connections	**IP line**: RJ45 socket for 10/100BaseT, IEEE 802.3 networks **KNX line:** KNX Wago bus connecting terminal (red/black) screw less for single-core cable Ø 0,6 to 0,8 mm		
Display elements	LED Power LED LAN-OK LED LAN-RX/TX LED for programming mode	LED Error LED KNX-OK LED KNX-RX/TX	
Control elements	Function button, Programming button		
Installation	on 35 mm DIN rail mount		
Type of protection	IP 20 according to EN 60529		

Bus	Safety extra low voltage 21…30V ⎓ SELV
Housing colour	Plastic PA66 housing grey
Dimensions	DIN-rail mounted device H= 90mm, W= 36mm (2 SU), D= 70mm Mounting depth 64 mm
Weight	66 g
Temperature range	Operation: -5°C… +45°C non-condensing Storage: -20°C… +60°C
Relative humidity	5% -93% non-condensing

CE Mark in accordance with	
• EMC Standard	2004/1008/EC
• RoHS	2011/65/EU

4.1 State of delivery

Note: Every CU-DIN IPRT KNX Router is delivered with these default parameters. Every device will be sent with its own MAC address.

Physical address	15.15.0
Physical address for tunnelling connections	15.15.255
IP address	DHCP
IP address assignment	from DHCP service
IP routing multicast address	224.0.23.12
IP subnet mask	DHCP
IP standard gateway	DHCP
IP to KNX	
Group telegrams 0-13	Filter
Main group telegrams 14-15	Transmit all
Physical telegrams	Filter
KNX to IP	

Group telegrams 0-13	Filter
Main group telegrams 14-15	Transmit all
Physical telegrams	Filter
Physical: Repetition if errors on sub line	normal
Group: Repetition if errors on sub line	normal
Telegram confirmations on line	if routed
Send confirmation on own telegrams	no

5 Application Description

If the coupler receives telegrams (for example during commissioning) which use a physical address as destination address, it compares the physical addresses of the receiver with its own physical address and then decides whether it must route the telegrams or not.
The coupler reacts to telegrams with group addresses in accordance with its parameter settings. During normal operation (default setting), the coupler only routes those telegrams whose group addresses have been entered in its filter table.
If the coupler routes a telegram and does not receive an acknowledgement, or if a bus device finds a transmission error, the coupler repeats the telegram three times. With the parameters „Repetitions if errors...“, this behaviour can be set separately for both lines. These parameters should be left in the default setting.

Note: ETS does not provide an unload procedure for the application of the IP-Router.

6 ETS-Parameters

6.1 Properties

Properties

Note: After loading the IP-Parameter and the device name over the ETS a manual restart has to be executed.

6.1.1 General

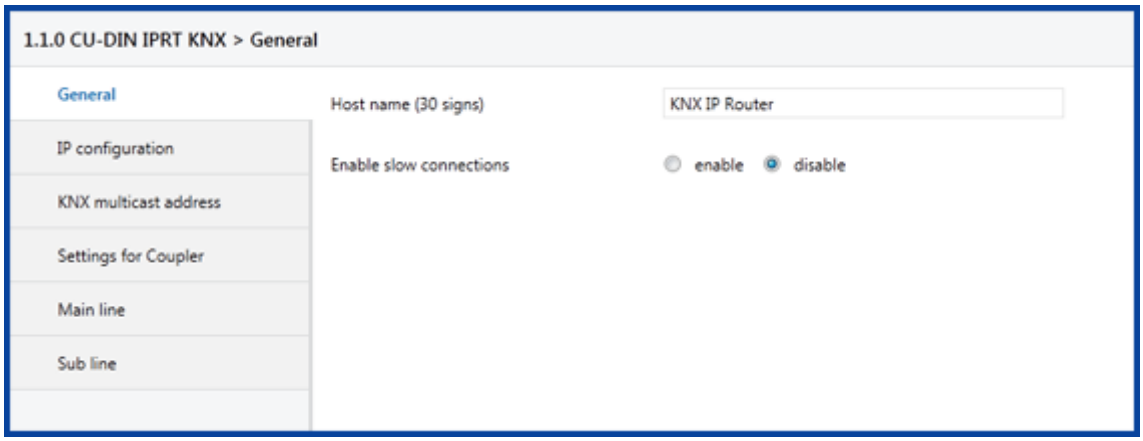


Fig. 1: General

ETS-Text	Range **[Default value]**	Comment
Host name	ZYXW **[KNX IP Router]**	Field to enter the CU-DIN IPRT KNX name (30 signs max.). For an easy search of the device with the ETS or with a KNXnet/IP visualisation system.
Enable slow connections	enable disable **[disable]**	Enable to support slow tunnelling connections

Table 1: Parameter General

6.1.2 IP Configuration

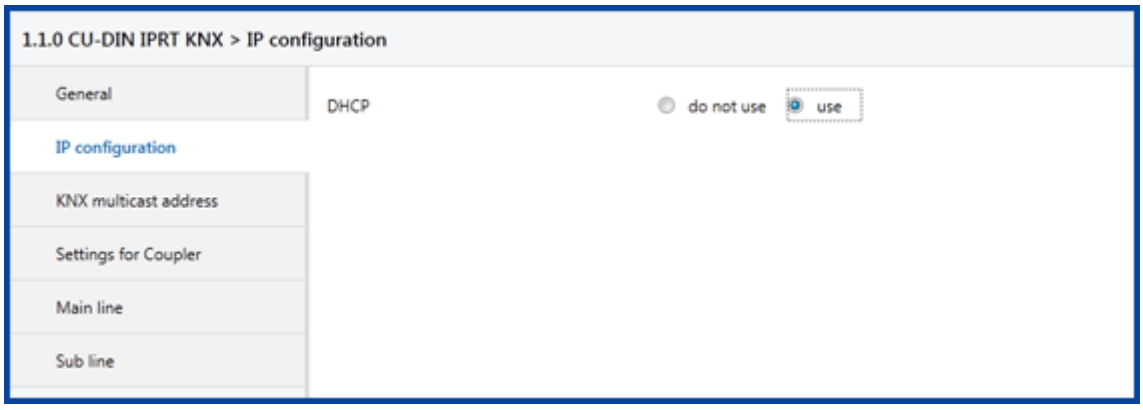


Fig. 2: DHCP configuration

ETS-Text	Range [Default value]	Comment
DHCP	use do not use **[use]**	If DHCP is used, no parameterisation needed. If DHCP is not used, following parameters are to be set.

Table 2: DHCP configuration

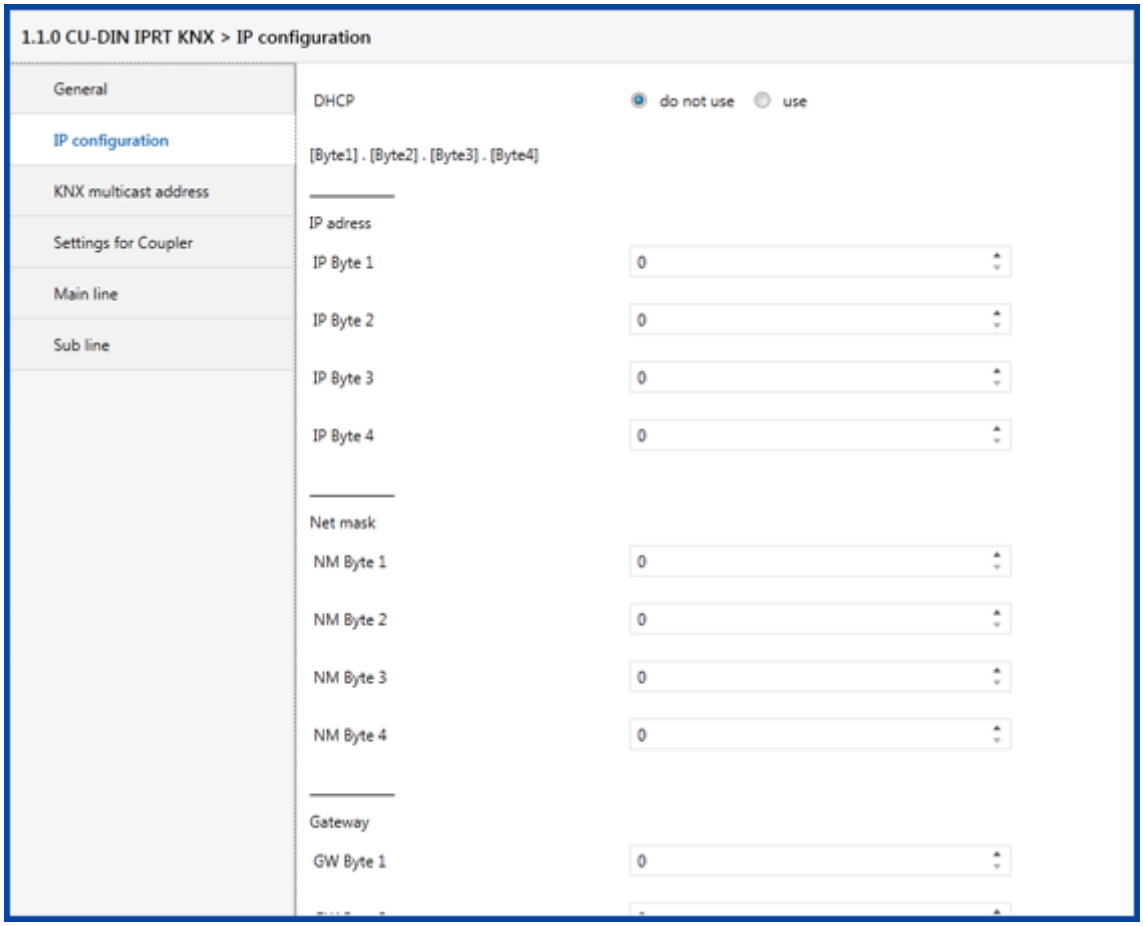


Fig. 3: DHCP manual configuration

ETS-Text	Range [Default value]	Comment
DHCP configuration [Byte1]. [Byte2]. [Byte3]. [Byte4]	use do not use **[use]**	If DHCP is not used, following parameters are to be set.
<u>IP Address</u> IP Byte 1 IP Byte 2	 0…255 0…255	IP Byte 1 to 4: manual input.

IP Byte 3 IP Byte 4	0...255 0...255	
Net mask NM Byte 1 NM Byte 2 NM Byte 3 NM Byte 4	 0...255 0...255 0...255 0...255	Net mask Byte 1 to 4: manual input.
Gateway GW Byte 1 GW Byte 2 GW Byte 3 GW Byte 4	 0...255 0...255 0...255 0...255	Gateway Byte 1 to 4: manual input.

Table 3: DHCP manual configuration

6.1.3 KNX multicast address

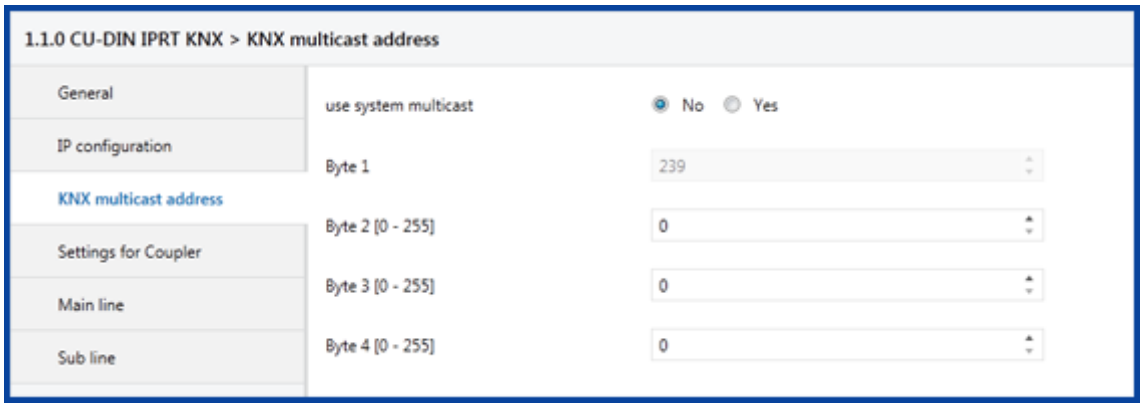


Fig. 4: KNX multicast address

ETS-Text	Range [Default value]	Comment
Byte 1 [224 ... 239]	224...239 **System: [224]** **Individual: [239]**	First byte of the IP routing multicast address. If System multicast address used: "224" is permanently set. If Individual multicast address used: "239" is permanently set.
Byte 2 [0 ... 255]	0...255	Second byte of the IP

	[0]	routing multicast address. Can only be set manually if an individual multicast address is used.
Byte 3 [0 … 255]	0…255 **[23]**	Third byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.
Byte 4 [0 … 255]	0…255 **[12]**	Fourth byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.

Table 4: KNX multicast address

Note: The Multicast IP address 224.0.23.12 is the defined address for the KNXnet/IP from the KNX Association in conjunction with the IANA. This address should stay as defined and only changed if it becomes necessary due to the existing network.
By commissioning, it should be regarded that all KNX IP devices which should communicate with one another via IP must use the same IP routing multicast address.

6.1.4 Settings for coupler

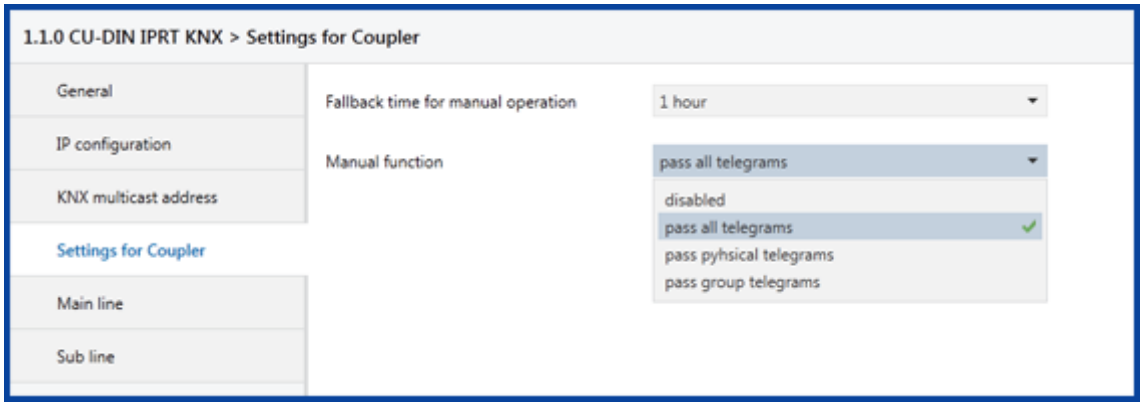


Fig. 5: Settings for coupler

ETS-Text	Range [Default value]	Comment
Fallback time for manual operation	10 min, 1 hour, 4 hours, 8 hours **[1 hour]**	Time duration required to exit from “manual operation”
Manual function	Disabled Pass all telegrams Pass physical telegrams Pass group telegrams **[pass all telegrams]**	Telegram routing configuration for the manual function.

Table 5: Parameter General

6.1.5 Main Line

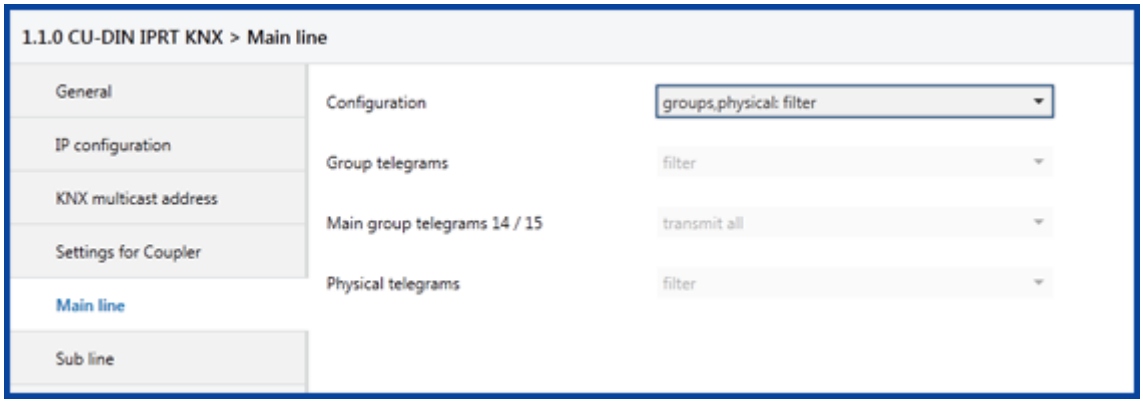


Fig. 6: Main Line/Configuration

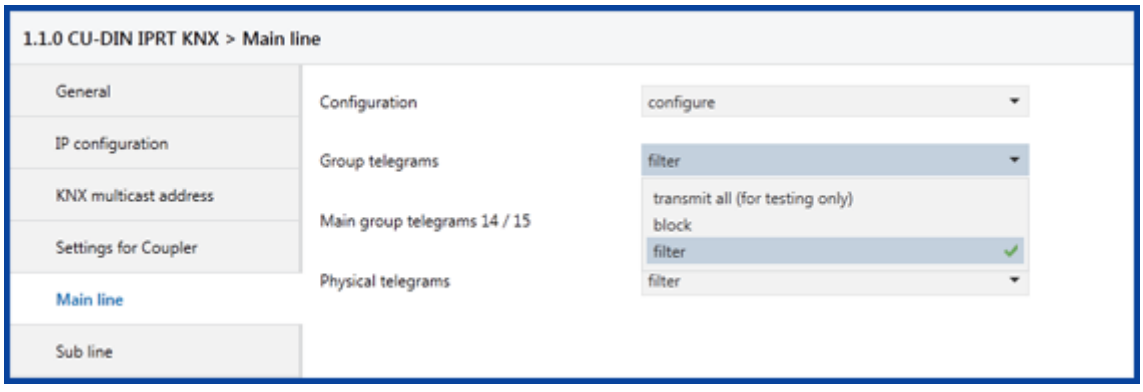


Fig. 6.1: Main Line/Group or physical telegrams configured individually

ETS-Text	Range [Default value]	Comment
Configuration	groups: filter, physical: block groups, physical: filter groups: route, physical: filter groups, physical: route configure **[groups, physical: filter]**	• Block: no telegram is routed. • Filter: Only telegrams are routed which are entered in the filter table. • Route: the telegrams are routed. • Configure: the following parameters can be set individually. This parameter is to be set depending on the planed configuration.
Group telegrams	1. transmit all (for testing only) 2. block 3. filter **[filter]**	1. All group telegrams are transmitted. 2. No group telegram is transmitted. 3. Only group telegrams are routed which are entered in the filter table. The ETS 3/4 produces the filter table automatically.
Main group telegrams 14/15	1. transmit all 2. block **[transmit all]**	1. Group telegrams with the main group 14 or 15 (e.g. 14/1) are routed. 2. Group telegrams with the main group 14 or 15 (e.g. 14/1) are not routed.
Physical telegrams	1. transmit all (for testing only) 2. block 3. filter **[filter]**	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted. 3. Only physical telegrams are routed based on physical address.

Table 6: Main Line

Note: Please note that the parameter “transmit all” for Group or Physical telegrams is intended only for testing purposes and it should not be set for normal operation.

6.1.6 Sub line

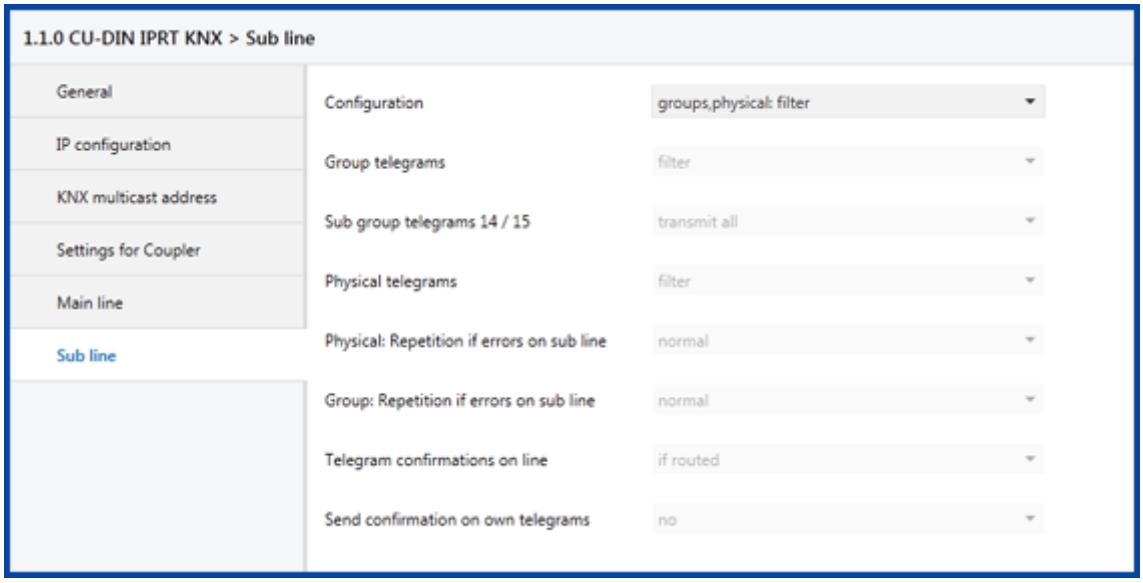


Fig. 7: Sub line

ETS-Text	Range [Default value]	Comment
Configuration	groups: filter, physical: block groups, physical: filter groups: route, physical: filter groups, physical: route configure **[groups, physical: filter]**	• Block: no telegram is routed. • Filter: Only telegrams are routed which are entered in the filter table. • Route: the telegrams are routed. • Configure: the following parameters can be set individually. This parameter is to be set depending on the planed configuration.
Group telegrams	1. transmit all (for testing only) 2. block 3. filter **[filter]**	1. All group telegrams are transmitted. 2. No group telegram is transmitted. 3. Only group telegrams are routed which are entered in the filter table. The ETS 3/4 produces the filter table automatically.

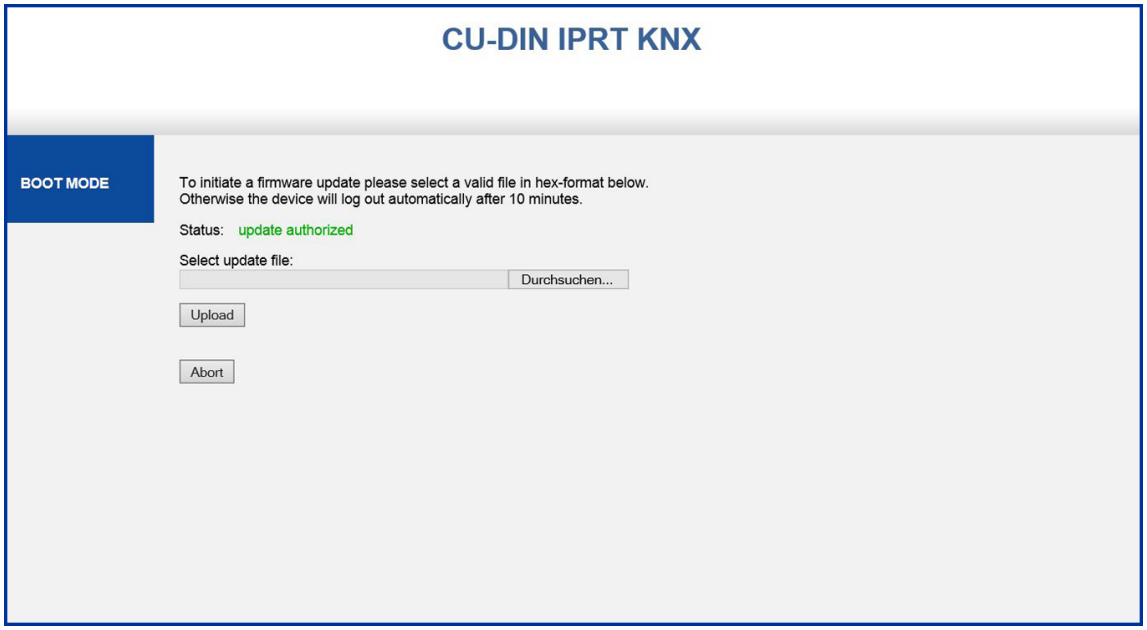
Sub group telegrams 14/15	1. transmit all 2. block **[transmit all]**	1. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are routed. 2. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are not routed.
Physical telegrams	1. transmit all (for testing only) 2. block 3. filter **[filter]**	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted. 3. Only physical telegrams are routed based on physical address.
Physical: Repetition if errors on sub line	1. no 2. normal 3. reduced **[normal]**	If a transmission error (e.g. due to missing receiver) is found when sending a physical telegram on the sub line: 1. The physical telegram is not repeated. 2. The physical telegram is repeated up to 3 times. 3. The physical telegram will be repeated only one time.
Group: Repetition if errors on sub line	1. no 2. normal 3. reduced **[normal]**	If a transmission error (e.g. due to missing receiver) is found when sending a group telegram on the sub line: 1. The group telegram is not repeated. 2. The group telegram is repeated up to 3 times. 3. The group telegram will be repeated only one time.
Telegram confirmations on line	1. if routed 2. always **[if routed]**	1. Only telegrams which are to be routed are confirmed on the sub line (ACK). 2. Each telegram on the sub line is confirmed (ACK).
Send confirmation on own telegrams	1. yes 2. no **[no]**	1. Every telegram on the sub line is confirmed with its own ACK (from the Line coupler). 2. No confirmation with own ACK

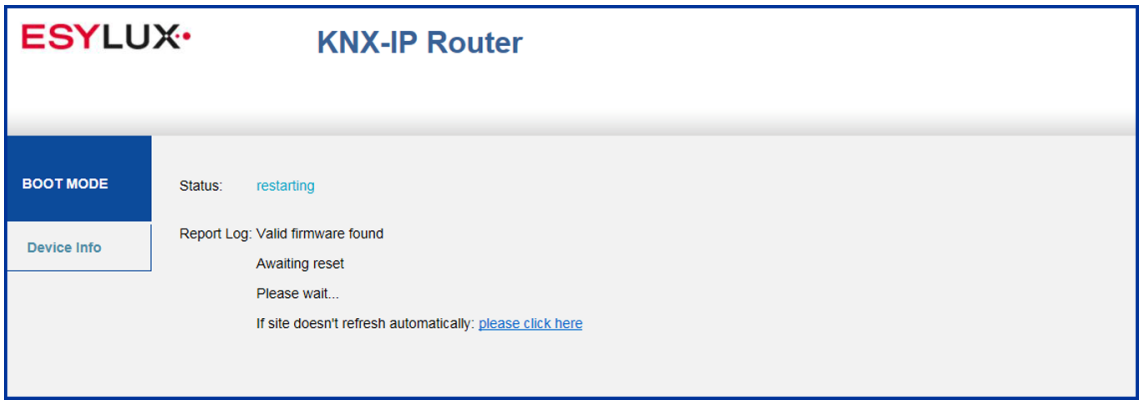
Table 7: Sub Line

Note: If the parameter “Send confirmation on own telegrams” is set yes, CU-DIN IPRT KNX will send an ACK systematically when sending any own routed telegram.

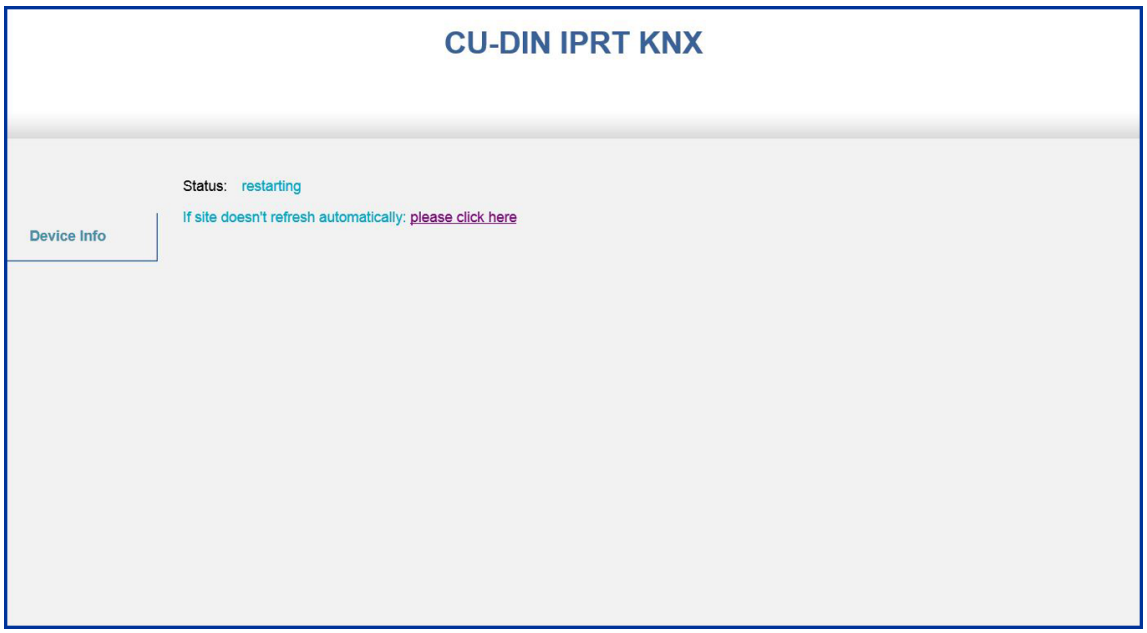
7 Windows presentation

7.1 Boot mode

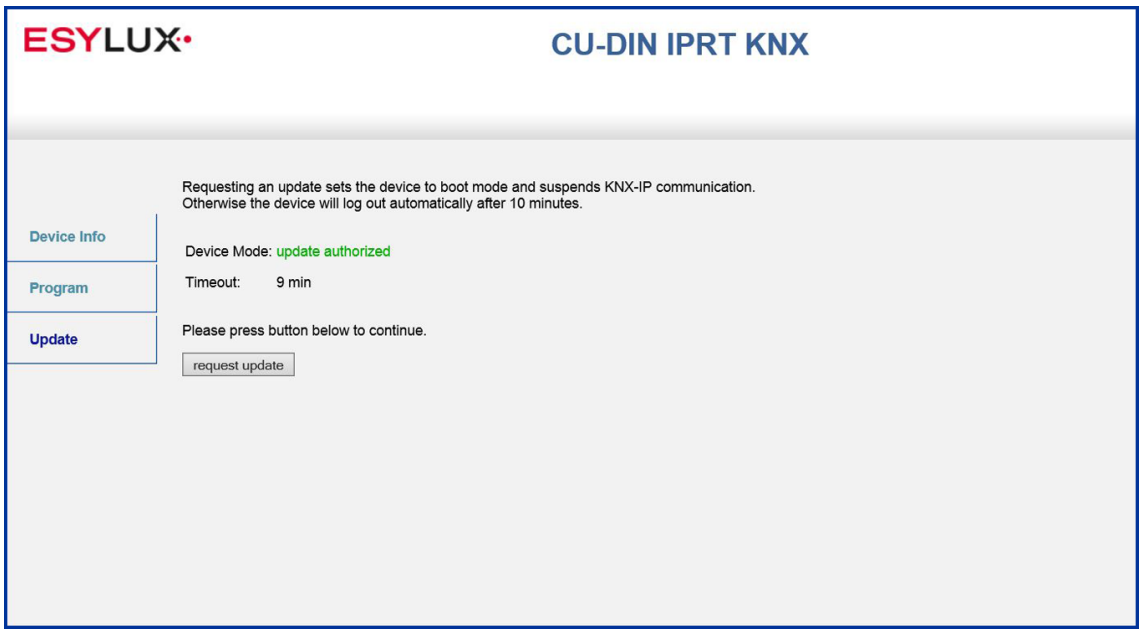

CU-DIN IPRT KNX
BOOT MODE
To initiate a firmware update please select a valid file in hex-format below.
Otherwise the device will log out automatically after 10 minutes.
Status: update authorized
Select update file:
Durchsuchen...
Upload
Abort

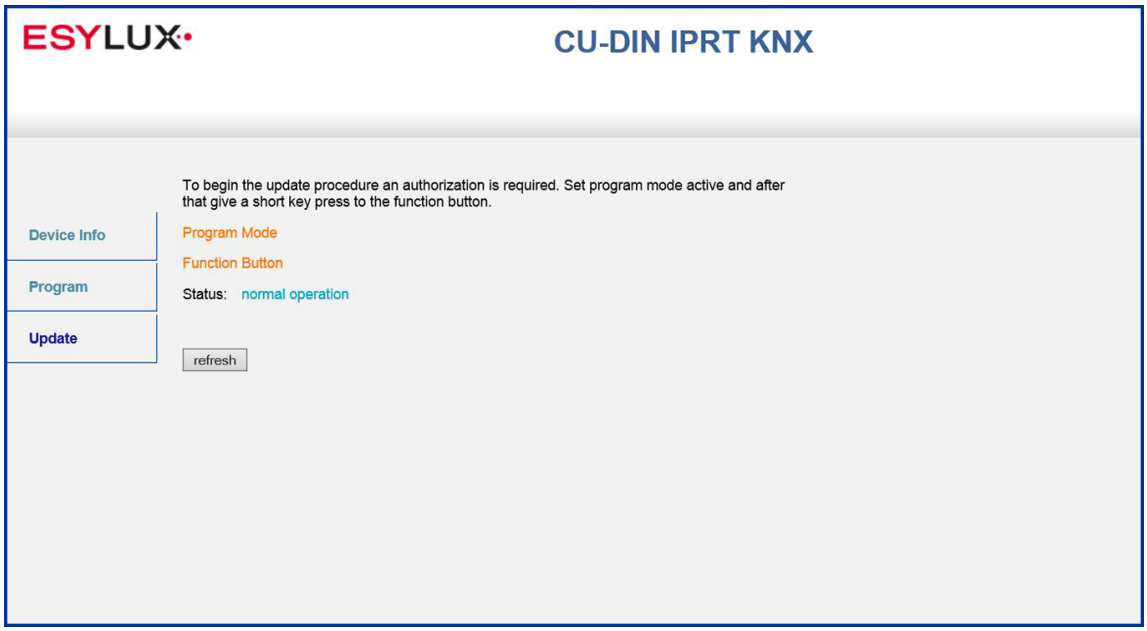


7.2 Normal mode


CU-DIN IPRT KNX
Status: restarting
If site doesn't refresh automatically: please click here
Device Info

ESYLUX
CU-DIN IPRT KNX
Program Mode: OFF
Turn Program Mode: ON OFF
Device Info
Program
Update


ESYLUX
CU-DIN IPRT KNX
Requesting an update sets the device to boot mode and suspends KNX-IP communication.
Otherwise the device will log out automatically after 10 minutes.
Device Info
Program
Update
Device Mode: update authorized
Timeout: 9 min
Please press button below to continue.
request update



8 Web front-end

Web front-end usage:
Please use the Web front-end directly on the device to load the firmware in the device. Therefor the device has to be opened over network in Windows 7 (or higher) as UPnP network device. Alternatively you can use the device name as URI base:
http://KNX-IP[type]-[XX][YY][ZZ]:8080/update.shtml
with the following parameters without brackets [ ]

[type] = “rt” for router, “if” for interface
[XX] = byte 4 of the MAC address, listed on the label at the housing
[YY] = byte 5 of the MAC address
[ZZ] = byte 6 of the MAC address

Note: This works only if the DHCP is enabled (to be changed in the ETS parameters if necessary).
Example for device with MAC D0-76-50-11-22-33:
Router:
http://KNX-IPrt-112233:8080
Interface:
http://KNX-IPif-112233:8080
Please follow the hints on the Web front-end.

9 Product disposal

This device must not be disposed of as unsorted household waste. Used devices must be disposed of correctly. Contact your local town council for more information.

10 ESYLUX manufacturer´s guarantee

ESYLUX products are tested in accordance with applicable regulations and manufactured with the utmost care. The guarantor, ESYLUX Deutschland GmbH, Postfach 1840, D-22908 Ahrensburg, Germany (for Germany) or the relevant ESYLUX distributor in your country (visit www.esylux.com for a complete overview) provides a guarantee against manufacturing/material defects in ESYLUX devices for a period of three years from the date of manufacture. This guarantee is independent of your legal rights with respect to the seller of the device.
The guarantee does not apply to natural wear and tear, changes/interference caused by environmental factors or damage in transit, nor to damage caused as a result of failure to follow the user or maintenance instructions and/or as a result of improper installation. Any illuminants or batteries supplied with the device are not covered by the guarantee.
The guarantee can only be honoured if the device is sent back with the invoice/receipt, unchanged, packed and with sufficient postage to the guarantor,

along with a brief description of the fault, as soon as a defect has been identified. If the guarantee claim proves justified, the guarantor will, within a reasonable period, either repair the device or replace it. The guarantee does not cover further claims; in particular, the guarantor will not be liable for damages resulting from the device's defectiveness. If the claim is unfounded (e.g. because the guarantee has expired or the fault is not covered by the guarantee), then the guarantor may attempt to repair the device for you for a fee, keeping costs to a minimum.